

CLAIMS

What is claimed is:

1. A stabilized AlPO_4 composition comprising CaO , SiO_2 and AlPO_4 at a ratio of greater than 0 to less than about 4 mole percent CaO , greater than 0 to less than about 10 mole percent SiO_2 , and greater than about 86 to less than about 100 mole percent AlPO_4 .
2. The composition of Claim 1 comprising CaO , SiO_2 and AlPO_4 at a mole percent ratio of greater than 0 to less than about 3 CaO , greater than 0 to less than about 6 SiO_2 , and greater than about 91 to less than about 100 AlPO_4 .
3. The composition of Claim 1 comprising CaO , SiO_2 and AlPO_4 at a mole percent ratio of about 2.3 CaO , about 5.7 SiO_2 , and about 92 AlPO_4 .
4. A stabilized AlPO_4 composition comprising XO , SiO_2 and AlPO_4 at a ratio of greater than 0 to less than about 4 mole percent XO , greater than 0 to less than about 10 mole percent SiO_2 , and greater than about 86 to less than about 100 mole percent AlPO_4 , wherein X is any cation with an atomic radius of about 1 angstrom.
5. The composition of Claim 4 wherein X is selected from the group consisting of potassium and copper.
6. The composition of Claim 4 or 5 wherein the mole percent ratio is about 2.3 XO , about 5.7 SiO_2 , and about 92 AlPO_4 .
7. A method for stabilizing AlPO_4 ceramic microstructures comprising the steps of:
 - a) admixing an acidic solution of AlPO_4 to solutions of SiO_2 and a calcium oxide source wherein the mole percent ratios are greater than about 86 to less than about 100 AlPO_4 , greater than 0 to less than about 10 SiO_2 , and greater than 0 to less than about 4 calcium;

- b) raising the pH of the admixture to form a slurry; and
- c) removing water to form the precipitate.
8. The method of Claim 7 wherein the acidity of the acidic solutions of step (a) is about 2.5.
9. The method of Claim 7 wherein the pH in step (b) is raised to about 9.
10. The method of Claim 7, 8 or 9 wherein the mole percent ratios are 0 to about 3 Ca, 0 to about 6 Si, and about 91 to about 100 Al.
11. The method of Claim 7, 8 or 9 wherein the mole percent ratios are about 2.3 Ca, about 5.7 Si, and about 92 Al.
12. An AlPO_4 composition that has a cubic structure, space group F-43m, with a ~ 7.2 Angstroms at a temperature of less than about 270°C .
13. A composition according to Claim 12 that is single phase.
14. A composition according to Claim 12 comprising a silica dopant and a dopant having a cation with an atomic radius of about 1 angstrom.
15. A composition according to Claim 14 wherein the dopant having a cation with an atomic radius of about 1 angstrom comprises CaO .
16. A composition according to Claim 12 wherein the cubic structure is maintained up to at least 1000°C .
17. A composition according to Claim 12 which is at a temperature in the range of from room temperature to about 250°C .